

III.—On the Bryozoa (*Polyzoa*) of the Bay of Naples.

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[Plates VIII.—XI.]

THE Bryozoa from the Mediterranean have received some little attention from time to time; but very much remains to be done, and on this account I made a collection during a few weeks' stay in the Zoological Station at Naples. My attention was specially given to the calcareous species, in order to compare the recent forms with the abundant Pliocene and Miocene faunas of Italy.

Marsigli (1725), G. Olivi (1792), St. delle Chiaje (1843, in *Descr. e Notom. d. Anim.*), and Costa (Fauna del Regno di Napoli) have given descriptions of a few species; but as the early conceptions of the Bryozoa were crude, these works are of little assistance.

In 1810 the 'Description de l'Egypte' was published, and a series of folio plates of the Bryozoa were prepared under the direction of J. C. Savigny; but as soon as these were completed a serious and ultimately fatal illness prevented him writing the description, or, in fact, being consulted as to what had been done; and it became necessary for the French government to insist on the work being brought to a conclusion, and M. Audouin was intrusted with the completion of the "Polypes." He gave a name to each of the figured forms, but no description; so that his work is only a catalogue of species named after some member of the expedition, or friends and a few French savants. It will thus be seen that a difficulty in nomenclature is introduced, as the figures frequently do not admit of determination, since the characters which are now used were not understood, and artistic fancy was allowed rather free scope; however the name given should be retained for those species which are clearly distinguishable.

In 1867 Prof. Cam. Heller published his 'Bryozoen des Adriatischen Meeres' (in *Verh. der k.-k. zool.-bot. Gesellsch. Wien*, tom. xvii.), which is a part of his series on the Adriatic zoology; and this will always be a most useful and important guide to the Mediterranean Bryozoa. And although I have ventured to make one or two changes, as in the case of *Lepralia perugiana* and *L. Steindachneri*, such alterations are only to be expected, especially when it is remembered that this is only one group out of many studied by Prof. Heller; and in the two cases mentioned I have perhaps had the opportunity of consulting more material than was available for Prof. Heller.

A number of papers by Reuss on the Eocene and Miocene,

in the 'Denkschriften' of the Vienna Academy, have been constantly consulted, as also the completion of the work by Dr. A. Manzoni, who has so ably taken up the study of the Italian Pliocene Bryozoa, and has published a series of papers in the 'Sitzungsberichte' of the same Academy, together with one on a few forms of recent Bryozoa. Smitt's papers and Busk's catalogue are the text-books employed.

For convenience I commence this paper with Lepraloid forms—though, as I am quite convinced that the genus *Lepralia*, as now understood, must soon be abolished, the division may seem very strange; but classification is in the first place useful for mere arrangement and for enabling zoologists to know with certainty what is meant when any species is mentioned, and the classification of the British-Museum Catalogue has assisted in this direction; but as knowledge advances an artificial arrangement has to give way before that which is more natural.

Smitt, the most careful observer of these animals, has proposed a classification in which the greatest weight is given to the form of the zoecia, and the shape of the aperture is largely used, instead of making the colonial form of growth the most important. Our own countryman, Dr. Hincks, has quite recently proposed, in these pages, a classification in much the same direction as Prof. Smitt; and both of these are, in my opinion, much superior to that in more general use. My reason for not at present adopting either is that there seem so many points which have not yet received their due attention, and there is so much material not yet worked up, that, for my own part, I am inclined to wait a short time, lest further knowledge should show that change is again necessary. The researches of Barrois on the embryology may furnish some landmarks. I have also noticed that the form of the operculum* is a most useful character in determination, as, besides showing difference in size and shape, the hinge of many is characteristic; and the position of the opercular muscles is another guide. In some cases the muscles are at the edge of the operculum; in others they are attached nearer the middle. A disk in the diaphragm of the Ctenostomata, and on the sides of the Cheilostomata, has been noticed by Reichert, Smitt, Nitsche, Ehlers, and Joliet, and has been called by them the "Ro-

* "The Use of the Opercula in the Determination of the Cheilostomatous Bryozoa," Proc. Manch. Lit. & Phil. Soc. vol. xviii. 1878.

In the present paper I will refer to the figures in the communication just cited by giving the number of the figure after the word operculum—thus, operculum (1*) means fig. 1.

For comparison the opercula should be examined by a power magnifying about 250 times.

It is scarcely necessary to say the principal value of the measurements is in giving the proportion of length to width.

settenplatte." This, I have shown, varies in nearly all species in such a manner as to be a most useful character, and, as it is connected with the mode of growth, may give important classificatory indications*.

It is perhaps necessary to Anglicize the term into "rosette-plate" on account of forming a plural; but I do not see any reason for giving a new name for what has been recognized by so many under that appellation, though perhaps some, anxious to give their own names, may suggest a fresh one.

The mode of attachment at the base will, I believe, when worked out, also show important variations. Until these points are further investigated I hesitate to make a change, lest it should be only temporary; but should Dr. Hincks, in his forthcoming work, have additional matter to support his classification, I shall be prepared to follow him. However, for the present, I use the classification which is already in the condemned cell, and which, in my opinion, no royal authority can long retain.

The drawings are made with the camera lucida, magnified 25 times, except in a few cases where it has been advisable to give figures magnified 50 times. I much regret not having more skill with the chalk, in order to better illustrate my meaning.

CHEILOSTOMATA.

1. *Lepralia Cecilii*, Aud. (Pl. VIII. fig. 6.)

Flustra Cecilii, Aud., Savigny, Egypte, pl. 8. fig. 3, p. 66.

Flustra Duboisii, Aud., Savigny, Egypte, pl. 8. fig. 4, p. 66.

Lepralia Cecilii, Aud., Busk, Journ. Micr. Sci. vol. v. pl. xv. figs. 6, 7, p. 173.

Lepralia perugiana, Heller, Bry. Adr. Meeres, p. 102, pl. ii. fig. 10.

Cells ovate; surface regularly perforated with small pores, except an elongated area below the aperture; pores arranged in irregular linear series round this imperforate area; mouth rounded above, straight below, with a very distinct sinus; surface often slightly raised near the sinus. Ovicell smooth, elongate, contracted near the aperture.

Audouin points out that *F. Duboisii* and *Cecilii*, Aud., are very much alike; and, in the absence of any description, I have ventured to unite them and to call the beautiful porcelainous species from the Bay of Naples *L. Cecilii*. My specimens all show an imperforate area; but this does not seem to be the case in others.

Busk, in his figure of a specimen from Jersey, shows a di-

* The end wall, which I merely speak of as the "distal wall," shows the most variation and is likely to be the most useful in determination.

distinct umbo; and this is evidently the same as *L. perugiana* of Heller; so that, if necessary, we may consider there is a variety with an umbo and one without.

A Red-Sea specimen in my possession has no umbo; and there is also one in the British Museum from Kino Channel, Japan, in which the form and measurement of the aperture are just the same as in that from Naples; but there is no distinct imperforate area, nor on the small fragment are there any ovicells.

Loc. Cornwall, Jersey, Adriatic, Red Sea, Japan.

2. *Lepralia vulgaris*, Moll. (Pl. X. figs. 1, 2.)

Eschara vulgaris, Moll, Seerinde, p. 61, pl. iii. fig. 10, A, B.

Lepralia vulgaris, Busk, Quart. Journ. Micr. Sci. vol. vi. 1858, p. 127, pl. xviii. fig. 3.

Flustra Duterei, Aud. in Sav. Egypte, pl. 9. fig. 2.

Cellepora otophora, Reuss, Foss. Polyp. d. Wien. Tert. p. 90, tab. 11. fig. 1.

Lepralia otophora, Reuss, F. Bry. Oest.-Ung. Mioc. p. 164, tab. 8. fig. 5.

?*Lepralia tumida*, Manz. Bryozoi di Castrocaro, p. 25, tab. iii. fig. 33.

Lepralia intermedia, Reuss, Oest.-Ung. Mioc. p. 160, tab. 8. fig. 11.

Although here cells are figured without a central umbo, I find that the majority have an umbo which is very variable in size, and there is also a projection on the ovicell.

The sinus of the oral aperture is well marked; and the tooth of the operculum, which fits into it, spreads out and terminates with a rounded edge. The width of the operculum (2*) is 0·108 millim., height ·08, length of sinual tooth ·028.

Loc. Oligocene, Miocene, and Pliocene (see 'Bry. from Bruc.'). Living: Ireland, Cornwall, Madeira, Mediterranean.

3. *Lepralia pertusa*, Esper. (Pl. VIII. fig. 5.)

It seems that under this name two distinct forms are mixed up, as some have the proximal edge of the operculum rounded, and others with a distinct sinus; but until I have the opportunity of examining more material I will only separate them as vars. *rotundata* and *sinuata*.

Var. *rotundata*. This is the variety in the British-Museum collections; and from Naples I have it without any avicularia, and also with an avicularium below the aperture, as in *auriculata*. This may be called var. *armata*.

Var. *sinuata*. This is the form drawn, and is the one figured by Manzoni (Supp. a. Fauna, pl. ii. figs. 5, 6). This sometimes has no avicularia, but very frequently one or two at the sides of the aperture.

Operculum (3*) ·168 millim. wide, ·160 long, including sinus.

4. *Lepralia ansata*, Johnst., var. *porosa*, Rss.

Cellepora Dunkeri, Reuss. Foss. Polyp. Wien. Tert. p. 90, pl. x. fig. 27.

Lepralia spinifera, Johnst. in Busk, B.M. Cat. p. 69, pl. lxxxi. figs. 6, 7; Manzoni, Bry. Pl. Ital. p. 7, pl. ii. fig. 11.

Lepralia unicornis, Johnst. in Busk, Crag Polyz. p. 45, pl. v. fig. 4.

Lepralia tetragona, Reuss, Foss. Bryoz. Oest.-Ung. Mioc. p. 159, pl. 7. figs. 1-3, &c.; Manzoni, Bry. foss. Ital. cont. 3, p. 8, pl. ix. fig. 19.

Mollia vulgaris, var. *ansata*, Smitt, Krit. Fört. ö. Sk. Hafs-Bry. 1867, vol. xxiv. p. 15, pl. xxv. figs. 79-82.

I am in doubt as to whether this group should be *ansata* or *unicornis*, but have followed Reuss in making *ansata* the type. Although the *spinifera* and *ansata* groups are mixed up in the British-Museum Catalogue under the name *spinifera*, they are easily distinguished by the form of the operculum.

Loc. Miocene, Austria and Hungary; Oligocene, Doburg; Pliocene, Castellarquato, Castrocaro, &c., and many localities in Sicily. Living: Arctic Ocean, Britain, Mediterranean.

5. *Lepralia auriculata*, Hass. (Pl. IX. fig. 5; Pl. XI. fig. 3.)

Lepralia auriculata, Hass. B.M. Cat. p. 67.

The piece drawn (Pl. IX. fig. 5) shows the various stages of growth of this species, which is very common in the Bay of Naples. *a* shows the commencement of calcification; *b*, the three oral spines are now always to be seen, and a depression at the proximal edge of the zoecia, and already the commencement of the avicularia is visible. The perforations are very distinct; but the granulation is also apparent, though not yet distinct. In the cells a little older the avicularia, projecting above the mouth, are raised and very distinct. The ovicells are soon formed in the depression already mentioned, as seen at *c* &c. and *d*. By the growth of the calcareous front of the cells the ovicells are soon immersed, as at *e*, and the granulations or warts on the surface become more prominent, though careful examination always shows the perforations as well. It is hardly necessary to say that it is only upon the younger cells that the oral spines are visible.

To give a complete idea of the colony drawn, I should have figured about five rows more of plain cells like *f*; and then we should reach the centre of the colony.

Pl. XI. fig. 3 shows a form which the avicularia sometimes take; but this is only a modification in size and position; for the avicularia may project very much in the ordinary position at right angles to the axis of the zoecia, and then the shape is seen to be the same as that figured in a horizontal position

(fig. 3). In most large colonies two or three such avicularia are usually found.

As I am not aware that this has been pointed out before, it may have struck some as strange that I should have allied a form figured* as var. *leontiniensis* with *auriculata*; but I think the specimens fully justify the determination; and, in fact, I have since found that *auriculata* grows frequently in the *Hemeschara* stadium, and often with many layers of cells one above another; so that it is very doubtful if the Bruccoli specimen is different from recent ones from Naples.

In *Eschara foliacea*, which has an avicularium somewhat similar to that of *auriculata*, horizontal avicularia sometimes occur; and the same variations are known in *E. pertusa*, M.-Edw., and in *E. macrochila*, Rss.

Widest part of operculum (13*) 0·1 millim., proximal edge 0·084, length 0·08.

Loc. Pliocene, Bruccoli. Living: Britain, Finland, Spitzbergen, Greenland.

6. *Lepralia ciliata*, Pall.

Escharina armata, D'Orb. Voyage dans l'Amérique, vol. v. p. 15, vol. ix. pl. 4. figs. 1-4.

Width of operculum 0·121 millim., length 0·073.

Loc. Miocene and Pliocene (see Bry. from Brucc.). Living: Arctic seas, Britain, Mediterranean, Florida, New Zealand (*Hutton*), South Africa, var. ? (*J. Boyd's* coll.), Novaja Semlja (*Smitt*, 1878), Falkland Islands (*D'Orb.*).

7. *Lepralia Malusii*, Aud.

Cellepora Malusii, Savigny, Egypte, pl. 8. fig. 8.

Manzoni ("Supplemento alla Fauna dei Bry. Medit.," Sitzb. Akad. Wissensch. Wien, lxiii., 1871, Taf. ii. fig. 2) gives a very good figure of this most beautiful *Lepralia*, but did not find in his specimens the stelliform pores; whereas in all I examined from Naples they are most distinct, and correspond exactly with the British specimens, as well as with one from Tierra del Fuego in the British Museum.

Heller mentions a variety (Taf. ii. fig. 3); but it appears as if some slip had been made about it, as there does not seem any thing in common.

The ovicells of *Lepralia personata*, Busk, are similar, as also the lunar pore; and we must look upon these two as re-

* "Bryozoa from the Pliocene of Bruccoli," Trans. Manch. Geol. Soc. vol. xiv. p. 469.

lated, though the Falkland-Islands *L. personata* has a large avicularium. The characters of the ovicells of *personata* are not quite sufficiently given in the 'Catalogue of the Marine Polyzoa.'

Operculum (30*) ·14 millim. wide, ·076 long.

Loc. Widely distributed; occurring in the northern seas (*Smitt*) and in South America and New Zealand. It has been found fossil in the English Crag and in the Pliocene of Castrocaro (Italy).

8. *Lepralia bimucronata*, Moll, var. *granifera*.
(Pl. VIII. figs. 2, 3.)

Lepralia granifera, Johnst. (part.) in Landsborough, History of Brit. Zoophytes, p. 309.

Zoecia ovate, front punctured all over with large stelliform pores, large central round or lunate pore on umbo; aperture rounded above, straight below, margin raised on both sides. Ovicells globose, smooth, with occasional small perforations. Operculum thicker at the two sides, corresponding to the raised margins.

This species is closely related to *L. Malusii*, but is much smaller (as will be seen from fig. 3, on the same scale as most of the species drawn), and has an umbo looking forward, so that often the semilunar or circular pore cannot be seen. It is difficult to decide if this should be considered a variety of Moll's *L. bimucronata*, as he does not figure any umbo; but sometimes cells are found without, or it might be overlooked.

It is also very closely related to *Lepralia granifera*, Busk, but does not, from an examination of the Museum specimen, appear to be exactly the same, though a variety, but is evidently the same as the umbonated variety figured by Landsborough.

One of our best authorities does not agree in thinking this the same as *bimucronata* of Moll; and if this is thought to be the case it might be called *granifera*, var. *occidua*, as the pore often cannot be seen. There are two small teeth in the lower edge of the pore.

Operculum (31*): width 0·116 millim., width of proximal edge 0·08, length 0·084.

Common, covering seaweed from depths of a few fathoms.

9. *Lepralia violacea*, Johnst.

Porina violacea, Smitt, Floridan Bryozoa, Kongl. Svenska Vet. Akad. Handl. 1873, vol. ii. pt. 2, p. 30.

I have only met with this two or three times at Naples, and then from depths of about 40 fathoms. Heller gives the depth as 20–55 fath., and Smitt as 35 fath.

Loc. Crag. Middle Pliocene of Belgium (*Houzeau de Lehaie* *). Living: Britain, Gibraltar, Roscoff (*J.*), Adriatic, Tortugas (Florida).

10. *Lepralia Brongniartii*, Aud. (Pl. IX. fig. 7.)

Lepralia capitata, Reuss, Foss. Bry. des Oest.-Ung. Mioc. p. 21, pl. iv. fig. 7.

Lepralia Brongniartii, Manzoni, Briozoi di Castrocaro, p. 20, pl. ii. fig. 27, pl. iv. fig. 54; id. Bry. fossil. Ital. contrib. 2, pl. ii. fig. 9.

The connexions between the zoecia are short tubes, as shown by Savigny's figure, but which are not given in Busk's catalogue. This is interesting as showing the first step towards more widely separated cells, like *Diachoris*; and Hutton calls a form very closely allied to this *Diachoris Buskia*.

These connecting tubes terminate with a convex end in the upper part of the zoecia, so that in the upper half of each cell are the spreading-out ends of the tubes of the zoecia above, while in the lower half are the tubes which terminate in the zoecia below them. I hope shortly to give a figure explaining this.

Loc. Miocene, Baden. Pliocene: Crag, Castrocaro (rare), Volterro. Living: Britain, Roscoff (*J.*), Adriatic (*Heller*); and there is a specimen from Japan in the British Museum. Naples, common on Algæ from moderate depths, 5-20 fath.

11. *Lepralia annulata*, Fab., var. *innominata*.

Lepralia innominata, B.M. Cat. p. 79.

Lepralia innominata, Couch, Manzoni, Suppl. Fauna dei Bryozoi Medit. cont. 1^a, and Bry. Plioc. Ital. cont. 1^a.

As *L. annulata*, *innominata*, and *scripta* pass gradually into one another, it will be well to distinguish the different forms as varieties of *annulata*.

Loc. See p. 7, Bry. from Brucc.

12. *Lepralia radiata*, Moll.

Eschara radiata, Moll, Die Seerinde, p. 70, pl. iv. fig. 17, A, B, C, D, E.

Flustra Pouilletii, Aud. in Sav. Egypte, p. 68, pl. 9. fig. 12.

Lepralia megacephala, Reuss, Polyp. d. Wiener Tertiärbeckens, p. 83, pl. x. fig. 5.

Lepralia scripta, Reuss, l. c. p. 82, pl. ix. fig. 28; id. Foss. Bry. Oest.-Ung. Mioc. p. 25, pl. i. fig. 7, pl. vi. fig. 1.

Lepralia scripta, Reuss in Manzoni, Suppl. alla F. dei Bry. Medit. cont. 1, p. 5, pl. i. fig. 6, and Bry. Foss. It. cont. 3, p. 4, pl. i. figs. 1, 2.

Lepralia radiata, Moll, in Busk, Quart. Journ. Micr. Sci. vol. vi. p. 263, pl. xx. fig. 4.

* 'Esquisse Géol. et Pal. des dép. plioc. d'Anvers,' par M. E. Vanden Broeck.

Loc. Miocene: several localities in Austria and Hungary, Turin. Pliocene: Piacenza, Tuscany, Bruccoli, &c. (Sicily). Living: Mediterranean, Red Sea (*Aud.*), Madeira (*Busk*), Florida (*Sm.*).

13. *Lepralia Gattyæ*, Landsb. (Pl. IX. fig. 6.)

Lepralia Gattyæ, Landsborough, Pop. Hist. of Brit. Zooph. p. 326, pl. xviii. fig. 71; B.M. Cat. p. 73, pl. lxxxiii. fig. 6.

Lepralia Steindachneri, Heller, Die Bryoz. des Adriat. Meeres, Verh. der k.-k. zool.-botan. Gesellsch. Wien, vol. xvii. 1867, p. 109, pl. ii. fig. 195.

?*Flustra Jaubertii*, Aud. in Sav. Egypte, p. 68, pl. 9. fig. 9.

The ovicell is large, orbicular, nearly as wide as the zoœcia, with a slightly raised keel above the aperture. The border of the ornamented area is deeply indented; and occasionally in each indentation rises a very minute spine. In the centre of the area is a tubercle which sometimes is prominently raised and bifurcate at the extremity. In fig. 6*a* this is seen surrounded with the minute spines just mentioned.

This is a semitransparent species, and, as it contains but little calcareous matter, is only to be satisfactorily seen when preserved in fluid, though the delicate radiating lines are only visible when dry.

I did not recognize from Busk's figure that it was the same as Heller's *L. Steindachneri*; but upon comparison of the British-Museum specimen found that it had a well-marked area as figured by Heller. The figure given by Landsborough is much better than that in the British-Museum Catalogue. I cannot see that this has much resemblance to *L. coronata*, Aud., which seems more to approach *L. vulgaris*.

Operculum (34*) ·068 millim. wide, ·04 long.

Loc. Lesina (Adriatic), Sidmouth, Jersey.

14. *Lepralia cribrosa*, Heller. (Pl. IX. fig. 4.)

Lepralia cribrosa, Heller, Die Bryoz. des Adriat. Meeres, p. 109, pl. 11. fig. 6.

The name *cribrosa* has already been used by Boeck for another species; but as Boeck's *cribrosa* is considered a synonym, I have provisionally retained Heller's name.

The zoœcia of this species are much larger than those of *L. Steindachneri*; but the two are evidently closely related. The ornamented area is perforated with small pores near the centre, and much larger ones at the edge; the ovicells have similar holes and radial lines. There is frequently an avicularium near the end of the ovicells, and usually one avicularium at

the side of the oral aperture; sometimes this is absent; and in other cases there is one on each side.

Heller has figured two vibracular processes, but does not mention them in his text; but I think, in spite of this difference, there is no doubt this is *L. cribrosa*.

I have figured terminal cells in order to show the structure of the connecting furrows. Before these are covered by the growth of the zoëcia they appear like ridges of pustules connected with the zoëcia on each side. The cells of most *Diachores* are connected by long distinct tubes; but in *Diachoris patellaria*, var. (Pl. XIII. fig. 4*), they are sometimes quite short, and in many specimens can only be seen when dissected; also in *Lepralia Brongniartii*, Aud., the zoëcia are connected by short tubes, as is well shown in Savigny's figure, and which form the "reticulated spaces" of Busk; and *L. cribrosa* shows another variation in this mode of connexion. There are several *Lepraliae* with similar rows of minute chambers between the zoëcia; and I think a study of the basal connexion would throw much light on the specific variation in the growth of the Bryozoa.

Loc. Lesina, on Algæ (Heller); Naples, on seaweed at slight depth.

15. *Lepralia verrucosa*, Esper.

Cellepora Endlicheri, Reuss, Foss. Polyp. d. Wiener Tertiärbeckens, p. 82, pl. ix. fig. 27.

Lepralia Endlicheri, Reuss, Die Bryozoen des Oest.-Ung. Mioc. p. 31, pl. i. fig. 9.

Cellepora scarabeus, Reuss, F. Polyp. p. 86, pl. x. fig. 14.

Lepralia scarabeus, Reuss, Br. Oest.-Ung. Mioc. p. 32, pl. i. fig. 10.

I am unable to see in the later figures of Reuss any material difference from recent *L. verrucosa*.

Loc. Miocene, Pliocene, Pruma (Calabria, *A. W.*). Living: Arctic Ocean (*Sm.*), Britain.

16. *Lepralia linearis*, var. *biaperta*. (Pl. XI. figs. 1, 2.)

Hippothoa biaperta, Smitt, Floridan Bryozoa, Handl. Kongl. Svenska Vetensk. Ak. 1872, vol. ii. pt. 2, p. 46, pl. viii. figs. 173-176.

Escharella linearis, Hass., forma *biaperta*, Busk, in Smitt, Krit. Fört. p. 14, 1867.

This form varies very much in its different stages; so that on the one piece I have from Naples the youngest cells most nearly correspond with *linearis typica*, having raised avicularia on each side of a ventricose cell, in a later stage the cells are the same as fig. 176 of Smitt, while in the oldest the aper-

* This Plate will appear in a future number.

ture is situated at the bottom of a deep depression as figured. In this depression are the two oral avicularia; and it is only upon the older cells that the large acute avicularia are found. The ovicells are very characteristic, being usually slightly raised, with a flat depressed area ornamented with radiating lines. Round the depressed oral aperture there is usually a ridge.

This is undoubtedly very nearly related to *L. biapertura* of the Crag; but I am not quite sure if it should be considered a synonym.

Operculum with a rounded proximal edge, .116 millim. wide, .12 millim. long, muscular impressions .064 millim. apart.

Found by Pourtales on shells and corals, Florida. Sea of Kara (*Smitt*, Bry. e Nov. Sem. & Jen. 1878). There is also a specimen in the British Museum (in the *Eschara stadium*) from Sio-ū-wha Bay, Tartary, lat. 42° N., long. 133° E.

17. *Lepralia linearis*, Hass., var. *hastata*, Hincks.

Lepralia linearis, Hass., var. *hastata*, Hincks, Ann. & Mag. Nat. Hist. ser. 3, vol. vii. p. 206, pl. xii. figs. 4, 4 a, and vol. x. p. 362.

Avicularian process half the length of the cell. On seaweed.

18. *Lepralia linearis*, Hass., forma typica, Smitt.

Lepralia linearis, Hass., B.M. Cat. p. 71; forma typica, Smitt, Krit. Fört. Skand. Hafs-B. 1867, pp. 13, 95, pl. xxiv. figs. 68, 69.

Occurs at Naples on seaweed &c. in 10–50 fathoms, with the two avicularia on rounded mamillary eminences.

Operculum (7*) rounded at the distal end, subtriangular at the proximal, with prominent hinge-processes; length 0.109 millim., width 0.1; muscular impression close to border, 0.6 millim. from the proximal apex.

Loc. Pliocene: Reggio. Living: Scandinavia (all depths), Finland, Britain, France, Adriatic.

19. *Lepralia linearis*, Hass., typa secundaria, Smitt.
(Pl. IX. fig. 2.)

This differs from the last form in having no avicularia. The large opening to the ovicell has a bar across, in the middle of which is a minute denticle on both sides for attachment of the horny cover.

Row of eight to ten lateral rosette-plates, one third of the height from the base. The distal wall has about four near the base, and two above these close to the side.

20. *Lepralia errata*, stadium *Hemeschara*. (Pl. X. fig. 5.)

Lepralia spinifera, Johnst. in Busk (part.), B.M. Cat. pl. xci. figs. 1, 2.

Under *spinifera* Busk has described widely different forms. The specimen in the British Museum, from which pl. lxxvi. figs. 2 & 3 is taken, is *spinifera* of Johnston, and has a large sinus, and the operculum (as far as could be seen without a preparation) nearly corresponds with that of *L. Cecillii*; while pl. xci. figs. 1, 2, appears the same as the one under consideration, which has a circular distal and proximal edge and distinct muscular impression.

Smitt has already separated some of Busk's forms of *spinifera*, but does not seem to have found the present.

Cells rhomboid, separated by divisional lines, coarsely punctured; mouth suborbicular; the proximal arc of the operculum, being smaller, gives the appearance of a large wide sinus; often an umbo below the mouth, an acute avicularium on one side; ovicells — ? Zoarium at the base with three or four layers, one over the other; from the incrusting base little stalked cups spring up. In the British Museum there is a piece, about 2 inches high, in which these cups are prolonged into long anastomosing tubes 4 millims. in diameter.

I do not see any difference in the Naples, Cape-of-Good-Hope, and Australian specimens, but have not yet had the opportunity of detail-examination of the latter.

Unfortunately the detail of this drawing does not appear, as it was transferred to the stone after the others, and apparently sufficient pressure was not given.

21. *Lepralia arrogata*, sp. nov. (Pl. VIII. fig. 1.)

Zoecia quincuncially arranged, ovate-rhombic; surface with pores and tubercles; aperture suborbicular, with a wide sinus; large acute avicularium nearly covers the front of the cell. Ovicell raised on the proximal half of each cell, with a flat, depressed, perforate space, bounded by an annular row of large tubercles.

The ovicells are very peculiar, and approach very closely to those of *Lepralia cheilostomata*, Manz. (third contribution), from the Pliocene of Castellarquato. Although the ovicells seem separated off and to belong to the zoecia above and on which they are situated, this is not the case, and they of course belong to the proximal zoecia. From this appearance the name is chosen.

The operculum (6*) is 0.125 millim. long, 0.125 millim. wide; the distal end is circular, the proximal triangular hinges very long (0.04 millim.) and narrow, with the muscles nearer the distal end.

22. *Lepralia coccinea*, Abild.

Lepralia coccinea, B.M. Cat. p. 70.

Loc. Upper Eocene of Northern Italy, and Miocene of Hungary. Pliocene: Castrocaro and Sicily from various places. Living: Northern seas to Mediterranean.

23. *Lepralia cucullata*, Busk. (Pl. X. fig. 4.)

Escharina torquata, Edw. Voyage dans l'Amérique par D'Orbigny, vol. v. p. 15, vol. ix. pl. iv. figs. 1-4.

Lepralia cucullata, Busk, Mar. Polyz. p. 81, pl. xcvi. figs. 4, 5.

? *Cellepora Magnevillana*, Aud. in Sav. Egypte, pl. 8. fig. 6.

? *Cellepora ovoidea*, Aud. in Sav. Egypte, pl. 8. fig. 1 (non Lamx.).

This species is very variable: sometimes there is no margin to the aperture; in other cases it projects very much, swelling out especially on the two sides, when it reminds us of the lips of *L. labiosa*. The surface is perforated with very large pores; and Mr. Busk's description, "granular," is neither correct for this nor for the British-Museum specimen of *cucullata*; but as the thick black membrane almost covers the specimen, it may have been difficult for him to see the structure; and on that account his fig. 4 is misleading; in fact, until I had made a comparison I did not think they were the same. The cells vary also in shape from widely ovate to elongate.

The operculum is very large and characteristic. At each side are two large round spaces, much thinner and lighter than the rest. The proximal end is nearly black with two light spots near the apex. In the specimen drawn (fig. 4a) the proximal end is open; but whether this is only the result of drying, or whether the animal can keep it open, I have not the opportunity of forming an opinion. Width of operculum (14*) .2 millim., length .22. The distal wall has normally six rosette-plates—four near the base, and one near each side above the two outside plates; lateral wall eight plates, with numerous perforations.

Loc. Ægean Sea (*Forbes*); Naples, on seaweed from shallow water; Rio de Janeiro (*D'Orb.*).

24. *Lepralia reticulata*, Macg., var. *ophidiana*.
(Pl. IX. fig. 1.)

I have felt some doubts as to whether this should be considered a species or variety, but upon comparison have come to the conclusion that the differences from *reticulata* are not very important.

This may be the same as *Flustra Legentilii*, Aud.; but as there is only a figure it seems somewhat doubtful, and there-

fore Smitt is not followed, though *Legentilii* is an earlier name than *reticulata*.

In some cases the peristome is very much raised, in others only slightly so, as figured; the ovicells are perforated, not very much raised and rather behind the peristome; the peculiar feature is the position of the avicularian mandible, which is much below the aperture, and often very long and projecting into the aperture of the cell below, when it is frequently bifid; and from this division, which reminds me of a serpent's tongue, it may be called var. *ophidiana* if there is any occasion to distinguish it. This is not the only case of the point of the mandible appearing divided, as it is sometimes so in *Escharella verrucosa*. Although the mandible is placed so low down, the avicularian chamber is immediately below the aperture, and the two pores just below the mouth open into this avicularian chamber.

Sometimes it is incrusting, at others partially free, so that to those who recognize the genus *Hemescharella* it would belong to it; but, following Smitt, I should call the two forms stadium *Lepralia* and stadium *Hemescharella*.

The operculum (26*) is subsemicircular, the lower margin slightly curved inwards, 0.19 millim. wide, 0.144 long. Muscular impression close to the border, about 0.08 from the proximal edge.

Inside the oral aperture there is a wide denticle.

There are three distal and six lateral rosette-plates. The distal plates are situated close to the basal walls.

L. reticulata has been found from the Arctic Ocean to New Zealand.

25. *Lepralia reticulata*, Macg., forma *inequalis*, nov.
(Pl. IX. fig. 3.)

The cells are ovate-elongate, punctured specially near the edges; internal denticle; but instead of having a single sub-oral avicularium, there is usually one on each side; sometimes one of these is very large, covering nearly the whole of the cell, with the other extremely minute. The peristome is considerably raised.

Operculum (33*) .16 millim. long, .1 millim. wide.

26. *Lepralia galeata*, Busk.

Lepralia galeata, Busk, B.M. Cat. p. 66, pl. xciv. figs. 1, 2.

Escharella porifera, Smitt, forma typica, Krit. Fört. ö. Sk. Hafs-Bry. 1867, p. 9, pl. xxiv. figs. 30, 32.

This has a distinct oral denticle, and has much resemblance

to *L. reticulata*, with which I think it would be well to unite it as var. *galeata*.

Loc. Falkland Islands, Tierra del Fuego (*Busk*); Spitzbergen and Greenland (*Smitt*); Lesina (*Heller*).

27. *Lepralia ventricosa*, Hass., var. (Pl. VIII. fig. 4.)

This is evidently closely related to the ordinary *ventricosa*, but differs in having the secondary aperture much raised, especially at the two sides. I have not succeeded in showing the cells as much raised and distinct in front, as is the case. On one cell only have I seen a small avicularium. The central cells are smaller than the younger ones, though this is slightly exaggerated from the position in which it was drawn.

28. *Lepralia Pallasiana*, Moll.

This is common at Naples.

At each side of the operculum there is a characteristic ridge, 0·11 millim. long, ending in two swellings.

The length of an operculum drawn (19*) is 0·18 millim., width 0·17, being about the size of the aperture as given by *Smitt*.

Loc. Pliocene: Bruccoli, Sicily, Crag. Living: Scandinavia, British coasts, Roscoff (*J.*), Adriatic (*Heller*).

29. *Lepralia Pallasiana*, Moll, var. *armata*, Busk.

This variety has an avicularium turned over the aperture as the ordinary avicularia of *L. auriculata*.

30. *Lepralia Pallasiana*, Moll, var. *projecta*.
(Pl. X. figs. 3, 3 a.)

This is studded with spinous tubercles about the length of the aperture; and in between are the pores. Below the aperture is a short spatulate avicularium.

I think it extremely probable that this is *Eschara Otto-Mulleriana* of Moll (*Seerinde*, fig. 15 A, B, C), but cannot be sure that the half-round pore on a prominence, which he mentions, is the avicularium.

Operculum (17*) ·248 millim. long, ·16 wide.

A rosette-plate at each basal corner of the distal wall; four lateral rosette-plates.

31. *Lepralia lata*, Busk. (Pl. XV. figs. 12, 13: next part.)

Lepralia lata, Busk, Quart. Journ. Micr. Sc. vol. iv. p. 309, pl. x. figs. 1, 2; Manzoni, Bry. Plioc. Ital. cont. 1, p. 4, pl. 1. fig. 6.

Lepralia Kirchenpaueri, Heller, Bry. Adriat. Meeres, p. 105, pl. ii. fig. 11; Manzoni, Supp. Fauna dei Bry. Medit. cont. 1, p. 8, pl. iii. fig. 3.

Lepralia cupulata, Manz. Bry. foss. Ital. cont. 3, p. 13, tab. iv. fig. 21; Waters, Bry. from Pl. of Bruccoli, Manch. Geol. Soc. vol. xiv. pt. 21, p. 473, fig. 6.

All my specimens are upon a small *Trochus*, and show considerable variation, so that on one piece some cells have the two large bosses, while others are without; and from these variations I think we are justified in reducing the synonymy.

Operculum (20*) suboblong, .104 millim. in length, .06 millim. wide, except at the base, where it is .08 millim.

Loc. Miocene, Pliocene, living. Add Pliocene, Castellarquato and Bruccoli.

32. *Lepralia fissa*, Busk. (Pl. XI. fig. 6.)

Lepralia fissa, Busk, Quart. Journ. Micr. Sc. vol. iv. p. 308, pl. ix. figs. 8, 9, 10.

The peristome is much raised, with long spines, but does not show the dentation mentioned by Busk; the walls are thin, granular, somewhat hyaline; and large avicularia occupy the space of a zoecium.

The small fragment from Naples very much resembles *L. Lyallii*, as figured by Busk, although none of the cells have a vibraculum. As the British-Museum specimen is, unfortunately, not in its place, I have been unable to make a comparison.

33. *Eschara foliacea*, stadium *Hemeschara*. (Pl. XI. figs. 4, 5.)

This is another case of finding cells similar in the *Eschara* and *Hemeschara* or *Lepralia* forms.

Figs. 4 and 5 are taken from different specimens.

The avicularia are very small, and are situated in the primary mouth. The globular ovicells have two openings just above the aperture; sometimes a raised peristome joins the ovicells; but as there are but few ovicells on the pieces in my possession, it is impossible to say how general this may be.

The ovicells of *Eschara foliacea* do not seem to have been described as yet.

Operculum (24*) somewhat sellate; width 0.18 millim.; muscular attachment central on the border of the operculum.

(The scale and most of the figures are magnified 25 times.)

[To be continued.]